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ADDITIONAL FROGS FROM CUBA.[1]

BY E. R. DUNN.

A second summer at the Harvard Biological Station at Soledad near Cienfuegos has enabled me to add materially to the remarks I made in 1925 (Occ. Papers, Boston Soc. Nat. Hist., Vol. 5, p. 163–166), and to offer diagnoses of four more species of *Eleutherodactylus* from Santa Clara Province, bringing the total number of species of that genus from Santa Clara up to eleven.

Thanks are due to Dr. Thomas Barbour, to the officials of Central Soledad and of its various Colonias, and to Mr. Caspari of Mina Carlota.

At Soledad I succeeded in getting the long-lost *Eleutherodactylus varians*, and in the Trinidad Mountains, at Mina Carlota, I took large series of three forms of which I had taken only a few the previous summer, and one which I had not taken before.

I have also examined the Cuban frogs in the United States National Museum, the American Museum of Natural History, and the Museum of Comparative Zoölogy, with the result that I shall describe another species from western Cuba, and give a tentative arrangement and key to the Cuban species of this troublesome genus.

As far as the Province of Santa Clara itself is concerned, there is no difficulty in discriminating between species, except in the cases of *ricordii* and *casparii* (which do not occur together), and of *ricordii* and *cuneatus* (which do occur together but whose resemblances are superficial). Some difficulty may be expected in distinguishing individuals of *auriculatus* from *eileenae*, or *greyi* from *pinarensis* and *brevipalmatus*, for these are vicarious forms confined to different provinces, and may even be found to intergrade.

E. gundlachi from Oriente and *E. casparii* from Santa Clara may be vicarious forms, but are well differentiated.

Other forms, such as *atkinsi* and *dimidiatus*, show slight geographical differences, not enough to warrant distinction; while *cuneatus* and *ricordii* and *sonans* range over the entire island without perceptible change; *ricordii*, however, does not occur in

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the higher mountains. We may reasonably expect a form like *gundlachi* eventually to turn up in Pinar del Rio.

The status of *sierra-maestrae* is in some doubt. It is very close to *brevipalmatus* and may turn out to be the same.

There are four groups of *Eleutherodactylus* in the island of Cuba, and the same four are also found in Hispaniola.

The *auriculatus* group is represented by *auriculatus* in Oriente, and is replaced by *eileenae* in the mountains of Santa Clara and Pinar del Rio. This seems to be a mountain-loving group of forms. The tiny *sonans* is found all over the island and is easily distinguished by its size and by its much smaller digital disks and tympanum. The peculiar *varians* is known definitely only from Soledad. It is an arboreal type and lives in the tallest trees in the old lowland forest, now so largely cleared away. These four species form a group which as a whole is characterized by enlarged digital disks, rugose belly, and short vomerine teeth.

The *dimidiatus* group is characterized by smooth skin above and below, by long vomerine series, very feebly developed disks, black cheek patch, and gray or tan color. Members of this series are largely restricted to the mountains, *dimidiatus* occurring throughout the island, and *emiliae*, which is quite distinct, being known only from Santa Clara.

The little *varleyi*, which has short vomerine series, rugose belly, feebly developed disks, a dorso-lateral glandular fold, and a pectoral vocal sac, seems rather isolated from the rest and forms a group by itself.

The majority of the forms, however, are allied to *ricordii* and agree with it in having rugose dorsum, long vomerine series, belly smooth or feebly rugose, and digital disks feebly developed or restricted to the two outer fingers.

In Santa Clara the small, short-legged *ricordii* is found near water in the low country, and in the mountains it is replaced by the longer-legged and differently marked *casparii*. Always associated with water is the web-footed *cuneatus*, which is found both in lowland and in mountains. Occupying a similar habitat to that of *ricordii* and *casparii* is the large, uniformly shagreened *greyi*, rather rare in the lowlands and more common in the mountains. In the dry forest and common in the lowland and rare in the mountains, is the beautifully colored *atkinsi*, with its markings of scarlet and black.

In Pinar del Rio *pinarensis* (the *varians* of Barbour, Stejneger, and Schmidt) replaces *greyi*, differing from it in rugose belly and slightly different color. *Cuneatus*, *ricordii*, and *atkinsi* are also found in this province.

In Oriente *brevipalmatus* replaces *greyi*, differing in its webbed toes. *Gundlachi*, with red legs and long warts, may replace *casparii*. *Cuneatus*, *ricordii*, and *atkinsi* are also found. The insufficiently known *sierra-maestrae* is allied to *brevipalmatus* and to *ricordii*, distinguished from the former by absence of webs and

by the more irregular warts, and from the latter by the larger size and in the more developed digital disks. It may turn out not to be distinct.

From the Isle of Pines I have seen *cuneatus* and *pinarensis*.

The species found in the neighborhood of the Harvard Biological Station at Soledad are *varians*, *sonans*, *varleyi*, *cuneatus*, *ricordii*, *greyi*, and *atkinsi*. Of these, *cuneatus* and *ricordii* are common and often met with; *atkinsi* is common in the dry woods at Guabairo but rare elsewhere; *greyi* is quite common; *varleyi* is common but small and seldom seen; *sonans* is common in bushes; and *varians* is uncommon and only in tall trees.

At Mina Carlota in the Trinidad Mountains, *atkinsi* and *ricordii* reached the mine itself at 1200 feet altitude, but did not extend farther into the mountains, being there replaced by *emiliae* and *dimidiatus*, and by *casparii*, respectively. *Varians* and *varleyi* did not seem to occur. *Eileenae*, the "Kolin" (not *dimidiatus*, as I erroneously suggested in 1925), was found at the mine and higher up, while *greyi*, *cuneatus*, and *sonans* were at all altitudes.

At Hoyo Colorado, in the San Blas division of the Trinidad Mountains, *atkinsi* was found in company with *dimidiatus* and *casparii*.

Key to the Cuban Species of Eleutherodactylus.

A. Belly coarsely granulated; vomerine series short; disks of fingers and toes well developed; a gular vocal sac.
  B. Tympanum one-half eye; disk of finger smaller than tympanum.
    C. Larger, male to 38 mm.; back smoother; Oriente ..... *auriculatus*.
    CC. Smaller, male to 26 mm.; small warts on back; Santa Clara and Pinar del Rio ..... *eileenae*, sp. nov. (p. 212).
  BB. Tympanum one-third eye; disk of finger equal to tympanum.
    C. Smaller, under 20 mm.; color rather uniform; finely granulated above ..... *sonans*.
    CC. Larger, male 25 mm.; irregular coarse marbling; scattered coarse warts above ..... *varians*.
AA. Belly granulated; vomerine series short; disks of digits not developed; a dorso-lateral line of warts; vocal sac extending onto chest; male 14 mm., female 17 mm. ..... *varleyi*.
AAA. Belly smooth; vomerine series long; disks of digits not developed; smooth above save for dorso-lateral fold; a black cheek patch.
  B. Legs longer; heel reaching eye; snout longer; no red in groin; larger, female 45 mm ..... *dimidiatus*.
  BB. Legs shorter; heel not reaching tympanum; snout shorter; red in groin; smaller, female 27 mm. ..... *emiliae*, sp. nov. (p. 213).
AAAA. Belly smooth or feebly granulated; back granulated or warty; vomerine series long; no black cheek patch.
  B. Feet webbed at base.
    C. Digital disks not developed; a W-shaped scapular fold ..... *cuneatus*.
    CC. Disks of fingers III and IV larger; uniformly shagreened above. *brevipalmatus*.
  BB. Feet not webbed.
    C. Uniformly shagreened above.
      D. Belly not granulated; color uniform ..... *greyi*, sp. nov. (p. 213).
      DD. Belly feebly granulated; indications of crossbars or dorso-lateral light lines ..... *pinarensis*, sp. nov. (p. 213).

CC. Not uniformly shagreened above.
D. Warts of dorsum well developed, no dorso-lateral line.
E. Warts of dorsum not elongated; groin not red.
F. Legs short, heels not overlapping, heel reaching eye; no V mark or wart on scapular region; no oblique bars on sides; disks of two outer fingers developed; maximum length 30 mm. *ricordii*.
FF. Legs long, heels overlapping, heel reaching snout.
G. Disks not developed; an inverted V on scapular region in both color and glandular fold; three oblique black bars on sides; small, maximum length 21 mm. *casparii*, sp. nov. (p. 215).
GG. Disks developed; larger, 38 mm..... *sierra-maestrae*.
EE. Warts of dorsum elongated; groin red; legs long..... *gundlachi*.
DD. Warts of dorsum feebly developed, save in dorso-lateral line; disks not developed; reddish brown; groin red..... *atkinsi*.

Eleutherodactylus auriculatus (Cope).

This species seems to be confined to Oriente. I have seen three specimens: two from "Eastern Cuba", collected by Charles Wright (probably in Yateras) and hence probably topotypes (U. S. N. M. Nos. 26640, 29776); and one from Monte Libano near Guantanamo (M. C. Z. No. 3117).

Eleutherodactylus eileenae, sp. nov.

Type.—No. 11128, Museum of Comparative Zoölogy, from Mina Carlota. Collected in July, 1925, by E. R. Dunn.

Diagnosis.—This species differs from its close ally *auriculatus* in its smaller size (male 26 mm.) and more rugose dorsum. From *sonans* it differs in having the tympanum much larger than the digital disks, in being much larger, and in being more rugose above.

I have seen 71 specimens, all from Pinar del Rio and Santa Clara, in which provinces it is locally famous as the "Kolin" and is the only species of the genus that has a distinctive popular name. It is known from Luis Lazo (M. C. Z. No. 4175); Guane (M. C. Z. No. 3726); San Diego de los Baños (U. S. N. M. No. 27862); Hoyo Colorado (M. C. Z. Nos. 10615–18); Mina Carlota (M. C. Z. Nos. 11128, 11444–60).

Eleutherodactylus sonans Dunn.

This occurs in all parts of the island and in Santa Clara at all altitudes. I have seen 20 specimens, as follows: Rangel (U.S.N. M. Nos. 54400, 54403); Soledad (M. C. Z. Nos. 10605–13, 11512–17); Mina Carlota (M. C. Z. No. 11511); Baracoa (U. S. N. M. Nos. 29829, 29831).

Eleutherodactylus varians (Gundlach and Peters).

This has been seen from Soledad (M. C. Z. No. 11131); and I have also seen one of Gundlach and Peter's cotypes (M. C. Z. No. 11621), which has no other data than "Cuba."

Eleutherodactylus varleyi Dunn.

This has been seen from all parts of the island, as follows: Havana (U. S. N. M. No. 57861); La Modesta (U. S. N. M. No.

36860); Matanzas (M. C. Z. No. 5001); Soledad (M. C. Z. Nos. 2841, 10599–604, 11536–48); Santiago (M. C. Z. No. 2414); in all, 33 specimens.

Eleutherodactylus dimidiatus (Cope).

This species has been recorded from Rangel in Pinar del Rio by Gundlach, but I have only seen specimens from Santa Clara and from Oriente: Hoyo Colorado (M. C. Z. Nos. 10226–31); Mina Carlota (M. C. Z. Nos. 11176–200); Guantanamo (U. S. N. M. Nos. 29767, 63234–5); Monte Libano (M. C. Z. No. 3050); Jiguani (M. C. Z. No. 3045); Cayo del Rey (M. C. Z. No. 3883); Pan de Azucar (M. C. Z. No. 3046).

Eleutherodactylus emiliae, sp. nov.

Type.—No. 11129, Museum of Comparative Zoölogy, from Mina Carlota. Collected in July, 1925, by E. R. Dunn.

Diagnosis.—This differs from *dimidiatus* as follows: legs shorter, heel not reaching to tympanum; snout short; concealed surfaces of thighs red; a black spot at groin, but no yellow one; much smaller (maximum length of female 27 mm., as against 45 mm. in *dimidiatus*).

I collected 26 specimens (M. C. Z. Nos. 11129, 11461–85).

Eleutherodactylus pinarensis, sp. nov.

Type.—No. 3814, Museum of Comparative Zoölogy, from Isle of Pines.

Diagnosis.—A large species uniformly shagreened above; belly feebly rugose; disks of fingers III and IV developed; tympanum nearly as large as eye; color marbled dark and light; young crossbarred dark and light.

This species, confined to western Cuba and the Isle of Pines, is the *varians* of authors (not of Gundlach and Peters). I have seen 44 specimens, as follows: Isle of Pines (M. C. Z. No. 3814); San Diego de los Baños (M. C. Z. No. 3948; U. S. N. M. Nos. 26741, 27651–2, 27860–1, 59329–35, 59348); Luis Lazo (M. C. Z. Nos. 3721, 4176–94); El Guamá (U. S. N. M. Nos. 27417–8); Guanajay (U. S. N. M. Nos. 27635–7); Rangel (U. S. N. M. No. 54399); Havana (U. S. N. M. Nos. 57862–3).

Eleutherodactylus greyi, sp. nov.

Type.—No. 11131, Museum of Comparative Zoölogy, from Soledad. Collected July 20, 1925, by E. R. Dunn.

Diagnosis.—This differs from *pinarensis* in being uniform in color or finely marbled above; young similar to adults and never with crossbars; belly smooth. This seems to be the largest Cuban species, the type measuring 65 mm.

I have seen 50 specimens, all collected by myself, as follows: Soledad (M. C. Z. Nos. 11131, 11527–34); Mina Carlota (M. C. Z. Nos. 11486–510); and from three localities in the San Blas division of the Trinidad Mountains (M. C. Z. Nos. 10614, 11065–8).

Named for Mr. Robert M. Grey, Superintendent for nearly thirty years of the Harvard Botanical Garden at Soledad.

Eleutherodactylus brevipalmatus Schmidt.

This form from Oriente differs from the two preceding in having webs at the base of the toes. It agrees with *greyi* in color and in

having a smooth belly. I have seen the two types from the Sierra Maestra (A. M. N. H. Nos. 6448–9), and four others from Pan de Azucar (M. C. Z. Nos. 3052–3), Monte Libano (M. C. Z. No. 3812), and La Patana (M. C. Z. No. 3054).

Eleutherodactylus sierra-maestrae Schmidt.

This differs from *brevipalmatus* in absence of webs, and from *greyi* and *pinarensis* in the dorsal warts being few and irregular. In the latter respect it is like *ricordii*, from which it differs in size, color, and greater development of the disks of the outer fingers. I have seen the type from the Sierra Maestra (A. M. N. H. No. 6450), and one specimen from Pan de Azucar (M. C. Z. No. 3047).

Eleutherodactylus ricordii (Duméril and Bibron).

Of this common small species, which has a larger tympanum and better developed disks on the outer fingers than any of the species of the group save the preceding larger forms, I have seen numerous specimens, as follows: Pinar del Rio (U. S. N. M. No. 27415); El Guamá (U. S. N. M. No. 27414); San Diego de los Baños (M. C. Z. Nos. 3714–9); Havana (U. S. N. M. Nos. 36605–9, 48795, 57638–9; M. C. Z. No. 2837); Matanzas (M. C. Z. No. 1457); La Modesta (U. S. N. M. Nos. 36850–6, 36858–9); Santiago de las Vegas (U. S. N. M. No. 36861); Soledad (M. C. Z. Nos. 2841, 10679–89, 11535); Mina Carlota (M. C. Z. Nos. 11201–11); San Blas (M. C. Z. Nos. 10676–8); Bayate, Guantanamo (A. M. N. H. No. 13129); Baracoa (U. S. N. M. Nos. 29821–8); Rio Tana, near Manzanillo (M. C. Z. No. 3051).

Eleutherodactylus cuneatus (Cope).

This form, which can immediately be recognized by its W-shaped scapular fold, webbed toes, and lack of digital disks, has been seen from the following localities: Isle of Pines (M. C. Z. Nos. 3791–6, 3813); Luis Lazo (M. C. Z. Nos. 4111–4); San Diego de los Baños (M. C. Z. No. 2838, 7; U. S. N. M. Nos. 26653–62, 27857–9, 59328, 59349–50); Rangel (M. C. Z. No. 5008; U. S. N. M. Nos. 54401–2); Pinar del Rio (U. S. N. M. No. 59325); El Guamá (M. C. Z. No. 2842; U. S. N. M. Nos. 27400–13, 27416); San Cristobal (U. S. N. M. No. 36849); Soledad (M. C. Z. Nos. 2839, 10690–700); San Blas (M. C. Z. Nos. 10701–12); Mina Carlota (M. C. Z. Nos. 11151–75); Oriente (U. S. N. M. No. 63236–7); Monteverde (U. S. N. M. No. 5702, type).

Eleutherodactylus gundlachi Schmidt.

This form is amply distinct from the rest of the group on account of its red thighs, lack of disks, and elongate dorsal warts. I have seen it from Monte Libano near Guantanamo (M. C. Z. Nos. 3056, type, and 3119); and from the Sierra Maestra (A. M. N. H. Nos. 6445–7). This is *Eleutherodactylus plicatus* Barbour 1919, Mem. Mus. Comp. Zoölogy, vol. 47, p. 107 (not *Hylodes plicatus* Günther, 1900, Biol. Cent.-Amer., p. 228). It was also

renamed by Nieden (1923, Das Thierreich, Lief. 46, Anura I, p. 416) as *E. barbouri*, but Schmidt's new name has priority.

Eleutherodactylus casparii, sp. nov.

Type.—No. 11130, Museum of Comparative Zoölogy, from Mina Carlota. Collected in July, 1925, by E. R. Dunn.

Diagnosis.—A species of small size (21 mm.); without developed disks; belly smooth; back irregularly warty; legs long, heel reaching to snout; three oblique black bars on sides; no dorso-lateral light streak; usually an inverted V on scapular region; this usually accompanied by a fold of similar shape; no red on legs; legs crossbarred.

This species is closely related to *ricordii*, having the same habits and habitat, and seems to replace it in the higher altitudes of the Trinidad Mountains. Its long legs and its coloration are sufficiently distinctive. I collected 28 specimens, as follows: Electric Plant at San Blas (M. C. Z. Nos. 10626–30); Hoyo Colorado at San Blas (M. C. Z. Nos. 10619–23); Mina Carlota (M. C. Z. Nos. 11130, 11430–43).

Eleutherodactylus atkinsi Dunn.

Of this very distinct and beautifully colored frog, I have seen the following series: Guane (M. C. Z. No. 3722); Soledad (M. C. Z. Nos. 2840, 10586–98, 11518–26); Hoyo Colorado (M. C. Z. Nos. 10624–5); Mina Carlota (M. C. Z. Nos. 11120–1); Bayate (M. C. Z. No. 3704); Guantanamo (U. S. N. M. No. 63238); Baracoa (M. C. Z. No. 3882); Siboney (M. C. Z. No. 10166); Santiago (M. C. Z. No. 2414); Cape Maisí (M. C. Z. No. 4073); El Guamá (U. S. N. M. No. 29757). This is the *E. cuneatus* of most recent authors.